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Screening of brinjal varieties against two spotted spider mite, *Tetranychus. urticae* (Koch) (Tetranychidae:Acari)

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ABSTRACT

An experiment was carried out to screen sixteen brinjal varieties against two spotted spider mite, *T. urticae* under field condition. Among all the sixteen brinjal varieties Pant bahar was found moderately susceptible to spider mite attack , while the brinjal variety JBGR-1 was tolerant to spider mite attack underthe field condition. Biomorphological characters of leaf *viz.*, hair density, leaf thickness, length and width also play important role on spider mite incidence on different brinjal varieties.

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INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most common and popular vegetable crop grown throughout the India. Among the arthropod pests of brinjal, the two spotted spider mite, *Tetranychus urticae* Koch (Tetranychidae: Acari) is the main threat next to shoot and fruit borer (Basu and Pramanik, 1968). This mite when reach on outbreak status, cause severe crop losses. The injury and the resultant yield loss is related to variables like the intensity of attack, weather conditions, the species of mite, the crop species and the variety (Van de Vrie *et al*., 1972). The search for resistant varieties begins with screening of available plant material of diverse origin. The present study, therefore, undertaken to evaluate the brinjal varieties for identifying the possible resistant varieties against infestation of two spotted spider mite, *T. urticae* underfield condition.

MATERIAL AND METHODS

The experiment was carried out during 2015 at Regional Horticultural Research Station, Navsari Agricultural University, Navsari. Sixteen brinjal varieties *viz.*, GBL-1, GBL-2, GBL-3, GJB-4, GOB-1, NSRP-1, NSR-1, JBGR-1, AB-08-05, AB-09-01, GJB-2, Arkanidhi, Arkakeshav, Panjabbasanti, Pusaupkar and Pant bahar were evaluated for their preference against *T. urticae* under open field condition. The seedlings of all the varieties were raised on raised seed bed and were transplanted 45 days after germination in the field. The plants were transplanted in plots of 5.4 x 3.75 m with

spacing of 75 x 60 cm. All the recommended agronomic practices were followed to raise the brinjal crop.

Weekly observation on the population of spider mite, *T. urticae* was taken commencing from a fortnight after transplanting and continued throughout entire crop period. For the purpose of investigation five plants were randomly selected each time and each variety replication wise. Population densities of spider mite was assessed by taking three random leaves representing top, middle and bottom canopy of the plant from respective variety. Thus, in all 15 leaves/ replication were observed at one time for each variety. The plucked leaves were held in separate polythene bags which were properly labelled and brought to Acarology laboratory for examination under stereo binocular microscope. On each leaf, the spider mite, *T. urticae* (mobile stages) were counted under stereo binocular microscope from 2 cm^2 area.The data on numerical count were averaged and converted to per unit area (per leaf bit or per leaf) and analysed statistically.To enumerate host plant resistance based on morphological physical leaf characters of all the sixteen varieties of brinjal, the observations of four morphological characters of leaves *viz*., length, width, thickness and density of hairs were recorded in the same way as well done in the sampling of mites described during crop period.The numbers of hairs was converted in 2 cm^2 area from upper and lower surface of leaf was recorded from the middle area of the leaf. The thickness of leaf was recorded from middle area of the leaf. The length and width of the leaves were also measured. To study the effect of four leaf characters on the build-up of spider mite, *T. urticae* population, the data recorded at successive interval on mite counts as well as morphological characters of leaves were pooled pertaining to each variety separately.

RESULTS AND DISCUSSION

During the period of present investigations, sixteen brinjal cultivars were screened for their reaction to spider mite, *T. urticae* under field conditions. The observations on the population of *T. urticae* were recorded at weekly interval from 2nd January 2015 to 26th June 2015 (1stto 26th SMW) and presented in Table 1. It is seen from the population data presented in Table 1, that in the 1st meteorological week *i.e.* on 2nd January 2015, the presence of spider mite, *T. urticae* were noticed on GJB-2, Arkakeshav, Panjabbasant and Pant bahar varieties of brinjal but on the other brinjal varieties spider mite population not recorded. In the 2nd meteorological week the incidence of the spider mite, *T. urticae* increased in all most all brinjal varieties except JBGR- 1, Arkanidhi and Pusaupakar which shows no spider mite attack. In the 3rd meteorological week the spider mite population was highest in Pant bahar varieties *i.e.* 3.13 spider mite per leaf. In 4th meteorological week the population fluctuated and the spider mite population per week varies from 0.50 to 4.53 mites per leaf on different brinjal varieties. Lowest mean spider mite population (0.50 per leaf) was recorded on JBGR-1 and maximum mean spider mite population was seen on Pant bahar (4.53 mites per leaf). During 5th meteorological week the spider mite population ranged between 0.80 to 6.53 mites per leaf. Brinjal cultivar JBGR-1 recorded spider mite least population (0.80 mites/ leaf). At the 6th meteorological week the minimum number of spider mites recorded on JBGR- 1 (1.42 mites/ leaf) while in 7th meteorological week population varied between 1.73 to 10.60 mites/ leaf with highest on Pant bahar (10.60 mites/ leaf) and lowest on JBGR- 1 and Pusaupakar (1.73 mites/ leaf). During 8th meteorological week spider mite population range between 2.73 to 12.53 mites/ leaf, while in 9th meteorological week JBGR-1 and Pusaupakar showed least population (3.73 mites/ leaf). In 10th meteorological week the spider mite population ranged between 4.73 to 17.53 mites/ leaf with least spider mite population on brinjal varieties JBGR- 1 (4.73 mites/ leaf). During 11th and 12th meteorological week similar trends of least and maximum population of Pusaupakar and Pant bahar were recorded. In 13th meteorological week the spider mite population was ranging between 7.13 to 21.00 mites/ leaf with maximum population on Pant bahar (21.00 mites/ leaf). In 14th meteorological week, the least mite population (8.07 mites/ leaf) and maximum mite population (22.00 mites/ leaf) were recorded in case of JBGR- 1 and Pant bahar, respectively. Similar condition of lowest and highest spider mite population were recorded during the 15th meteorological week. Observations recorded during 16th and 17th meteorological week revealed that JBGR-1 had lowest spider mite population (9.33 and 9.45 mites/ leaf) and Pant bahar had maximum spider mite population (23.40 and 23.33 mites/ leaf). In 18th meteorological week the higher spider mite population were recorded in almost all brinjal varieties. During 19th and 20th meteorological week the

Table 1 : Spider mite, *T. urticae* population on different brinjal varieties in field condition

SMW	Date of observation	Brinjal varieties															
		GBL-1	GBL-2	GBL-3	GBL-4	GOB-1	NSRP-1	NSRP-2	NSR-1	JBGR-1	AB-08-05	GJB-2	Arkanidhi	Arkakeshav	Panjabbasant	Pusaupkar	Pant bahar
01	02-01-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.10	0.20	0.00	0.40
02	09-01-15	0.10	0.10	0.10	0.20	0.15	0.11	0.10	0.14	0.00	0.40	0.42	0.00	0.50	0.52	0.00	0.93
03	15-01-15	0.30	0.35	0.30	0.38	0.48	0.40	0.20	0.81	0.15	1.00	1.00	0.30	0.80	2.00	0.31	3.13
04	23-01-15	0.40	0.80	0.50	1.00	1.05	0.80	0.40	1.80	0.50	1.13	2.00	0.87	1.03	3.15	0.50	4.53
05	30-01-15	1.22	1.25	0.90	2.30	1.80	1.00	0.75	3.20	0.80	2.12	3.89	1.77	3.05	4.95	1.00	6.53
06	06-02-15	2.20	2.80	1.30	4.00	2.60	1.91	1.48	5.50	1.42	3.95	5.78	2.50	4.82	7.01	1.49	8.53
07	15-02-15	3.80	4.20	3.60	5.85	3.93	4.31	3.70	6.85	1.73	5.50	8.00	2.93	6.50	9.33	1.73	10.60
08	23-02-15	5.70	6.20	5.60	8.15	4.65	4.32	6.00	8.80	2.73	8.13	9.12	3.93	8.90	11.03	2.73	12.53
09	01-03-15	7.60	8.20	6.60	9.13	6.63	6.20	8.13	10.00	3.73	10.00	11.93	5.60	11.00	12.50	3.73	14.53
10	05-03-15	9.10	10.20	8.00	11.13	8.73	8.50	9.50	12.90	4.73	12.80	14.70	5.58	13.93	16.40	4.90	17.53
11	14-03-15	10.10	11.00	8.50	12.80	9.30	9.00	11.50	13.80	6.40	13.80	15.13	6.80	15.20	17.40	6.00	18.53
12	20-03-15	11.00	11.70	9.60	13.00	10.20	9.60	11.50	14.00	6.07	14.10	16.47	7.20	15.93	17.87	6.88	19.00
13	28-03-15	13.20	13.60	11.50	14.33	12.27	11.20	12.50	15.80	7.50	16.50	17.80	8.20	17.93	19.87	7.13	21.00
14	04-04-15	14.20	14.67	12.73	15.00	14.20	12.00	13.00	16.07	8.07	17.00	18.80	9.20	18.93	20.87	8.80	22.00
15	10-04-15	14.60	15.50	13.30	15.80	14.75	12.60	13.50	17.00	8.20	17.00	19.12	9.50	19.00	21.20	8.85	22.20
16	17-04-15	15.00	16.30	14.20	17.00	15.95	14.00	14.50	18.00	9.33	17.87	20.20	10.80	19.90	22.20	9.80	23.40
17	26-04-15	15.80	17.00	14.30	16.93	16.17	13.88	14.80	18.50	9.45	18.50	20.20	10.47	20.00	22.20	9.95	23.33
18	03-05-15	15.93	17.50	14.73	17.00	16.20	14.20	15.00	19.00	9.60	18.80	20.10	10.57	20.00	22.30	10.00	23.47
19	07-05-15	15.60	17.00	14.00	17.00	15.80	13.70	14.80	18.50	9.40	19.10	20.47	10.20	19.80	22.00	10.00	23.33
20	13-05-15	15.60	16.50	13.80	16.53	15.40	13.50	14.50	17.80	9.30	17.93	18.87	10.33	19.20	21.33	9.27	23.40
21	22-05-15	15.73	16.00	13.50	16.53	14.53	13.40	13.80	17.65	9.20	17.73	19.47	10.27	19.20	21.27	9.13	23.27
22	28-05-15	15.63	15.80	13.30	16.27	10.40	12.60	13.27	16.80	9.00	17.53	18.47	10.07	19.13	21.23	9.13	23.20
23	03-06-15	10.80	11.00	9.30	12.20	7.73	7.50	9.80	13.20	5.30	13.47	15.33	6.67	14.27	16.40	5.67	17.53
24	11-06-15	8.93	7.50	5.67	9.00	5.00	5.33	7.00	9.60	3.87	8.73	12.50	4.87	9.60	11.60	3.80	12.87
25	18-06-15	2.93	3.80	1.67	5.00	2.00	1.33	2.50	5.50	1.80	4.53	6.13	2.73	5.47	7.33	1.47	8.80
26	26-06-15	0.87	2.00	1.00	2.00	1.80	0.93	1.00	2.70	1.00	4.00	6.57	1.40	4.00	5.33	0.13	7.53
Seasonal mean		8.71	9.27	7.62	9.94	8.14	7.40	8.20	10.92	4.97	10.84	12.41	5.88	11.85	13.75	5.09	15.08

population varied between 9.40 to 23.33 and 9.27 to 23.40 mites per leaf. During 21st and 22nd meteorological week the maximum spider mite population was recorded in Pant bahar varieties (23.27 and 23.20 mites/ leaf) while lowest spider mite population per plant were recorded on Pusaupkar (9.13 mites/ leaf). From 23rd to 26th meteorological week sudden decrease in spider mite population was observed because of the maturation of crop, where the brinjal varieties JBGR-1 and Pusaupkar showed least spider mite population and Pant bahar showed highest spider mite incidence among the sixteen brinjal varieties. Highest spider mite population recorded in case of Pant bahar and least in case of JBGR- 1 with overall seasonal mean of 15.0 and 4.97 mites per leaf, respectively. In past very little attempts seems to have been made to search for mite resistance in available cultivars of brinjal and there is no published information available.In the present study where in sixteen cultivars

Table 2: Reaction of brinjal varieties tospider mite,*T. urticae* in field condition

Sr. No.	Cultivars	Mean mite population± S. D.	Reaction to spider mite
1.	GBL-1	8.71± 6.16	Tolerant
2.	GBL-2	9.27± 6.41	Tolerant
3.	GBL-3	7.62± 5.56	Tolerant
4.	GBL-4	9.94± 6.31	Less susceptible
5.	GOB-1	8.14± 5.94	Tolerant
6.	NSRP-1	7.40± 5.36	Tolerant
7.	NSRP-2	8.20± 5.78	Tolerant
8.	NSR-1	10.92± 6.64	Less susceptible
9.	JBGR-1	4.97± 3.63	Tolerant
10.	AB-08-05	10.84± 6.89	Less susceptible
11.	GJB-2	12.41± 7.16	Moderately susceptible
12.	Arkanidhi	5.88± 3.86	Tolerant
13.	Arkakeshav	11.85± 7.42	Less susceptible
14.	Panjabbasant	13.75± 7.80	Moderately susceptible
15.	Pusaupkar	5.09± 3.82	Tolerant
16.	Pant bahar	15.08± 7.91	Moderately susceptible

Table 3 : Effect of biomorphological characters of brinjal varieties on *T. urticae* incidence

Sr. No.	Name of cultivars	Mean mite population ± S.D.	No. of trichomes/ 2 cm^2 leaf	Thickness of leaf	Length of leaf	Width of leaf	Reaction to spider mite
1.	GBL-1	8.71± 6.16	40.18± 1.33	0.34±0.11	9.76± 0.78	6.92± 0.83	Tolerant
2.	GBL-2	9.27± 6.41	40.86± 1.22	0.38± 0.11	9.46± 0.99	6.46± 0.53	Tolerant
3.	GBL-3	7.62± 5.56	39.57± 1.33	0.34± 0.15	9.62± 0.71	6.7± 0.65	Tolerant
4.	GBL-4	9.94± 6.31	40.67± 0.94	0.38± 0.11	10.18± 0.60	7.62± 1.14	Less susceptible
5.	GOB-1	8.14± 5.94	40.55± 1.21	0.34± 0.11	9.48± 0.85	6.52± 0.70	Tolerant
6.	NSRP-1	7.40± 5.36	39.71± 1.46	0.28± 0.12	9.68± 0.89	6.94± 0.79	Tolerant
7.	NSRP-2	8.20± 5.78	40.08± 1.24	0.40± 0.13	9.8± 0.73	7.18± 0.59	Tolerant
8.	NSR-1	10.92± 6.64	40.92± 1.24	0.44± 0.13	10.42± 0.73	7.84± 0.67	Less susceptible
9.	JBGR-1	4.97± 3.63	49.27± 1.24	0.24± 0.08	8.34± 0.38	5.28± 0.39	Tolerant
10.	AB-08-05	10.84± 6.89	40.79± 1.31	0.47± 0.11	10.66± 0.99	7.76± 0.68	Less susceptible
11.	GJB-2	12.41± 7.16	40.46± 1.16	0.51± 0.10	11.12± 0.58	8.06± 0.66	Moderately susceptible
12.	Arkanidhi	5.88± 3.86	46.60± 1.31	0.28± 0.05	8.86± 0.71	5.96± 0.65	Tolerant
13.	Arkakeshav	11.85± 7.42	38.73± 1.36	0.50± 0.08	10.16± 0.70	7.44± 0.62	Less susceptible
14.	Panjabbasant	13.75± 7.80	42.68± 1.48	0.50± 0.10	11.72± 0.75	7.94± 0.68	Moderately susceptible
15.	Pusaupkar	5.09± 3.82	46.37± 1.32	0.29± 0.06	8.96± 0.65	5.82± 0.66	Tolerant
16.	Pant bahar	15.08± 7.91	26.65± 1.09	0.59± 0.80	12.2± 0.73	8.4± 0.67	Moderately susceptible

have been screened for their reaction to spider mite, *T. urticae*, the intensity of infestation ranged from 0.00 to 17.50 mites per leaf and it was found that GBL-1, GBL-2, GBL-3, GOB-1, NSRP-1, NSRP-2, JBGR-1, Arkanidhi and Pusaupkar were tolerant, GBL-4, NSR-1, AB-08-05 and Arkakeshav were less susceptible, whereas GJB-2, Panjabbasant and Pant bahar were moderately susceptible to the spider mite, *T. urticae* attack field conditions, but the present finding were compared to the similar type of work carried out by various researchers on vegetable crops under field conditions (Table 2). Similar reactions were reported by Ghosh and Senapati (2001) who also confirmed that Pusa Purple Cluster is a variety with low resistance against spider mite.Naga and Sharma (2009) revealed that maximum population of spider mite was recorded on PusaSawani (4.07 mites/3 leaves), whereas, it was minimum on Arka Anamika (1.90 mites/3 leaves). However, this trend continued till peak population was observed in the third week of September, where varieties ArkaAnamika, VRO-6 and VRO-5 harboured spider mite population ranging from 3.71 to 3.98 mites/3 leaves and remained statically at par to each other being regarded as less susceptible. Whereas, Parbhani Kranti, Varsha Uphar and Pusa Sawani harboured maximum population (6.78 to 7.14 mites/3 leaves) and proved highly susceptible. The other varieties ranked in middle order of susceptibility. The ascending order of susceptibility was Arka Anamika, VRO-6, VRO-5, Hybrid No. 18, D-108, Bhanu Priya, GO-2, Parbhani Kranti, Varsha Uphar and Pusa Sawani. Among different gerbera cultivars, Cherany was highly tolerant and stanza was medium tolerant due to spider mite activities on it under polyhouse (Shah and Shukla, 2013). Further, Shukla and Radadia (2015) also reported that among the carnation varieties the variety Domingo was highly tolerant to spider mite having highest spider mite population, while variety Rubisco was highly susceptible to spider mite attack. Thus, these earlier work are more or less in support with present findings.

Biomorphological character of brinjal varieties:

During the experiment period, the various morphological characters of sixteen varieties of brinjal were recorded. These various characters represented in the Table 3. They were just discussed in the light of incidence of mean number of spider mite population. The spider mite population and the number of trichomes per leaf bit of different varieties were recorded and it is evident from the Table 3 that the mean spider mite population was highest on Pant bahar (15.08 mites/ leaf) having less number of trichomes (26.65) among all the brinjal varieties, while the spider mite population was recorded minimum (4.97mites/ leaf) in JBGR-1 cultivar having 49.27 trichomes per leaf bit. Other leaf character *viz*., thickness of leaf, length of leaf, and width of leaf also showed that the maximum spider mite population was recorded on Pant bahar having the maximum thickness of leaf (0.59 mm), length of leaf (12.2cm) and width of leaf (8.4 cm). In JBGR-1 shows lowest thickness of leaf (0.24 mm), length of leaf (8.34cm) and width of leaf (5.28 cm). It is also evident from the data that the more number of trichomes the spider mite attack is less. So, on the basis of the present observations recorded on biomorphological character of sixteen brinjal cultivars it can be concluded that spider mite population were maximum in those varieties having thick leaf, more length and width, as compared to those having less thickness of leaves, less length and width of leaf, as seen in Pant bahar and JBGR-1 cultivars of brinjal.Misra *et al*. (1990) found a significant negative correlation between density of brinjal leaf hairs and spider mite population. Apart from others was minimum on brinjal variety ABH-2 which was found to have maximum density of hairs among all varieties. But the correlation was not significant. Hence, it is not be directly linked with mite resistance.

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REFERENCES

Basu, A.C. and Pramanik, L.M. (1968). Acaricidal tests of nine pesticides against the two – spotted spider mite, a serious pest of brinjal (egg plant) in West Bengal. *J. Econ. Entomol*., **61** : 768-780.

Ghosh and Senapati, S.K. (2001). Evaluation of brinjal varieties commonly grownin Terai region of West Bengal against pest

complex. *Crop Res.*, **21**(2): 157-163.

Misra,K.K., Sarkar, P.K. and Das, T.K.(1990). Incidence of *Tetranychus cinnabarinus* (Boisd.) (Acari: Tetranychidae) on some selected accessions of brinjal with special reference to physical basis of resistance. *Ann. Entomol. Soc. Am.*, **72** : 177-185.

Naga, B.L. and Sharma, A. (2009). Varietal screening of okra, *Abelmoschus esculentus* (L.) moench against mite, *Tetranychus cinnabarinus* (Boisduval). *Indian J. Appl. Entomol.*, **23**(1): 40-43.

Shah, D.R. and Shukla, A. (2013). Reaction of gerbera cultivars to spider mite,*Tetranychus urticae* Koch (Tetranychidae: Acari) under polyhouse condition. *J. Plant Protec. Sci.*, **5**(2) : 26-32.

Shukla, A. and Radadia, G.G. (2015). Reaction of carnation varieties to two spotted red spider mite, *Tetranychus urticae* Koch. (Tetranychidae: Acari) under polyhouse conditions. *J. Exp. Zool. India*,**19**(1): 151-154.

Van De Vrie, M., McMurtry, J.A. and Huffaker, C.B. (1972). Ecology of tetranychid mites and their natural enemies: A review. III. Biology, ecology and pest status and host plant relations of tetranychids. *Hilgardia*, **41**: 343-432.

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